

## An Update on Arthrogyposis Multiplex in Cattle

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During the past eight weeks (since September 8, 2008), researchers at the University of Illinois and the University of Nebraska, in collaboration with the American Angus Association, have been investigating the genetic condition called Arthrogyposis Multiplex (AM), commonly referred to as "Curly Calf Syndrome (CCS)" in Angus cattle. At this time, we feel it is important to provide some details concerning the results of this research and provide answers to some frequently asked questions that we have encountered.

We are pleased to announce that the research has been very successful thus far and we are nearing completion of our work. Using breeder reports on AM affected calves as well as DNA samples obtained from these calves and many of their parents, we have been able to identify the gene and mutation that we believe is responsible for this genetic abnormality. From this information, we have developed an accurate DNA-based diagnostic test that can be used to assess an individual's status for AM. As part of test development, we have been able to provide the genotypes and AM status of 736 AI sires and feel that it would be beneficial to release these results to the industry.

These sires were used as an essential part of our research for three purposes. Firstly, a broad cross section of genetics representing the Angus breed is necessary to assess the validity of any diagnostic test that is developed. This assessment is based on the principle that because AM is a lethal abnormality, and because we assume a recessive mode of inheritance, there should not be any living animals that are homozygous for the mutation. Secondly, if our assessment is correct and we have identified the mutation that causes AM, then the results of testing would provide genotype information for all of the sires submitted. This would allow breeders to assess the genetic risk of their breeding programs and prepare for implementation of future testing programs. Lastly, this sampling provides an overall assessment of the frequency of the mutation within the entire Angus population and provides insight for the development of policies aimed at management within the population.

The naming scheme that we have chosen to use for this test identifies animals as having one of three possible genotypes. If an animal is homozygous for the normal variant (called an allele) we refer to them as **AM-Free (AMF)** indicating that they have been tested for the causative mutation and been found to be "free" of the mutation. Therefore these animals are unable to transmit it to any of their offspring. If the individuals are tested and found to be heterozygous or "carriers" for the mutation, meaning that they possess one normal allele and one mutant allele, they are referred to as **AM-Carrier (AMC)**. These animals pass the mutation on to approximately half of their offspring. Although affected calves are rarely tested, they would be homozygous for the mutation and referred to as **AM-Affected (AMA)**. This nomenclature is based on several concepts. Firstly, although the term "curly calf" certainly describes the outward appearance of some of these calves, the term is also problematic for a couple of reasons. Because of the tremendous global success of the Angus breed we need to consider the international implications of the terminology that we use. For example, in Australia the term "curly calf" is commonly used to describe a form of arthrogyposis that is caused by viral infection and not genetic mutation. Thus, in Australia the "curly calf" term might cause some confusion between the two forms of the disease, e.g. infectious or genetic. Secondly, the term used should have relevance to the more technical aspects of the disease, particularly for veterinary professionals who might encounter the condition as part of their practice. In these

instances, if they are unfamiliar with the condition it is more likely that they will investigate it using the medical descriptors and not common terminology. Lastly, there is a precedent for describing these recessives that has scientific merit and is already in place within other organizations. In this case we have decided to use the term Arthrogyriposis Multiplex (AM) as the technical name for this condition. This reflects not only the most obvious characteristic of the condition, but also indicates there are multiple abnormalities associated with the condition. Additionally, AM also fits well with a gene-based naming system that will become more obvious as the results of the research are presented in the scientific literature.

In regard to the accuracy of the test, there are two distinct components that contribute to how the DNA test performs. The first component involves the scientific data that underlie the test. The second component is the design and execution of the diagnostic assay performed as part of the testing procedure. From a scientific standpoint, the AM test is based on the presence of a specific change or mutation in the DNA sequence of specific genes of an animal. For AM, this change is the complete deletion of a segment of DNA that encompasses two different genes (a gene is a sequence in the DNA that encodes a protein). One of these genes is expressed at a crucial time in the development of nerve and muscle tissue. The mutation results in no protein being produced from this gene and therefore it is unable to carry out its normal function, referred to as a loss-of-function mutation. After identifying the specific mutation, experiments were conducted to validate the relationship between the mutation and AM. Based on these experiments, we believe that the scientific basis of the test is accurate; in other words, testing for this specific mutation will lead to correct classification of any animal. In regard to the diagnostic assay that is used for determining an animal's AM status, the test has undergone several optimizations that also lead us to believe that the test is highly reproducible and accurate. However, as with any task requiring human intervention, errors can occur. Of course, we do our best to limit any errors that occur by automating portions of the test and appropriately incorporation of testing controls. Although we cannot guarantee perfection, we estimate the assay may have an error rate of around 1 in 10,000. Therefore, for the listed AI sires we believe the following results to be accurate. These results are being released prior to the availability of commercial testing services. We intend to facilitate access to commercial services within the next 30 to 45 days.

| <b>Name</b>                  | <b>Registration No.</b> | <b>AM Status</b> |
|------------------------------|-------------------------|------------------|
| Skylandmere 2058             | 2719761                 | AMF              |
| R R Rito 707                 | 5770651                 | AMF              |
| Rito 707 of Ideal 533 70     | 6810901                 | AMF              |
| Band 602 of Ideal 928 72     | 7530738                 | AMF              |
| Jetliner 707 of Conanga      | 7795918                 | AMF              |
| Q A S Traveler 23-4          | 9250717                 | AMF              |
| Rito 9J9 of B156 7T26        | 9682589                 | AMC              |
| Tehama Bando 155             | 9891499                 | AMF              |
| Pine Drive Big Sky           | 9894245                 | AMF              |
| Scotch Cap                   | 10226429                | AMF              |
| Paramont Ambush 2172         | 10239760                | AMF              |
| Basin Emulation 5653         | 10312571                | AMF              |
| R&J Spade 1204               | 10566557                | AMF              |
| R R Traveler 5204            | 10705768                | AMF              |
| G D A R Rito 596 L T         | 10717881                | AMF              |
| N Bar Emulation EXT          | 10776479                | AMF              |
| S A F Power Fix              | 10809778                | AMF              |
| Gorthy of Graham 18866       | 10842597                | AMF              |
| G D A R Equalizer 6148       | 10845727                | AMF              |
| S S Traveler 6T6             | 10889102                | AMF              |
| G D A R Traveler 71          | 10988296                | AMF              |
| Rito 8E8 of 5H11 Traveler    | 11072078                | AMC              |
| Med Rock Traveler JR         | 11086635                | AMF              |
| V D A R New Trend 315        | 11105489                | AMF              |
| Nugget 801X of J R S         | 11107151                | AMF              |
| Hoff Northlander S C 6029    | 11138672                | AMF              |
| Hoff Spade Flush S C 678     | 11138705                | AMF              |
| Hoff Hi Hand S C 654         | 11138729                | AMF              |
| Hoff Bold Scotch S C 491     | 11138801                | AMF              |
| G T Maximum                  | 11160685                | AMF              |
| G T Expo                     | 11160688                | AMF              |
| Patton Enticer               | 11194446                | AMF              |
| Schoenes Fix It 826          | 11196470                | AMF              |
| Ginger Hill Duster 89        | 11216670                | AMF              |
| Rito 9M9 of 2036 Scotch Cap  | 11223752                | AMF              |
| Rito 9FB3 of 5H11 Fullback   | 11223766                | AMF              |
| G D A R Traveler 9161        | 11278961                | AMF              |
| G D A R Centennial 911       | 11279048                | AMF              |
| Hoff Balancer S C 7109       | 11288972                | AMF              |
| Hoff Hi Flyer S C 7134       | 11297283                | AMF              |
| R&J Maxima                   | 11314694                | AMF              |
| O C C Maternal Trend 725Y    | 11335168                | AMF              |
| G A R Sleep Easy 1009        | 11356568                | AMF              |
| Sitz Traveler 8180           | 11367940                | AMF              |
| Westwind Rito 8503 D J H 019 | 11391800                | AMF              |
| Finks Future Trend           | 11408407                | AMC              |

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| B/R New Design 036           | 11418151 | AMF |
| Basin E Z                    | 11424367 | AMF |
| G D A R Wham 021             | 11447288 | AMF |
| G D A R Traveler 044         | 11447335 | AMF |
| L R A New Trend 360          | 11447845 | AMF |
| Woodhill Valor               | 11451070 | AMF |
| Woodhill Triple Threat       | 11451073 | AMF |
| R&J Maternal Power 270       | 11478173 | AMF |
| G A R Precision 1680         | 11520398 | AMC |
| Rito 1H13 of 5C7 Rito 9J9    | 11527181 | AMF |
| N Bar Cornhusker Y2741       | 11553377 | AMF |
| S V F Hi Road                | 11556105 | AMF |
| V D A R New Trend 802        | 11563543 | AMF |
| Hyline S V F Rito 1116       | 11581539 | AMF |
| V D A R Traveler 722         | 11592069 | AMF |
| Hoff Triumph S C 927         | 11594860 | AMF |
| Hyline Travel Agent          | 11595790 | AMF |
| Minerts Fortune 2000         | 11618176 | AMF |
| California Traveler          | 11618614 | AMF |
| R R 9440 Scotch Cap 1483     | 11620571 | AMF |
| Ideal 1418 of 8103 4286      | 11626546 | AMF |
| W F A Four Point Four        | 11640955 | AMC |
| Rito 2E2 of 9FB2 Traveler    | 11656252 | AMF |
| Becker Farms Pompey 118      | 11672313 | AMF |
| Rito 2RT2 of 0B5 RR Traveler | 11691408 | AMF |
| S A Double Power 1002        | 11702184 | AMF |
| Leachman Conveyor            | 11741667 | AMF |
| S A F Neutron                | 11747039 | AMF |
| Mill Coulee Performer 224    | 11779097 | AMF |
| Summitcrest Hi Flyer 3B18    | 11783725 | AMF |
| Danina Northerner            | 11789903 | AMF |
| Summitcrest Scotch Cap 0B45  | 11847053 | AMF |
| G A R Bingo 4192             | 11872308 | AMF |
| Nichols Easy Way 428         | 11887141 | AMF |
| Spring Cove True Value       | 11924057 | AMF |
| Whitestone Traveler 2149     | 11927423 | AMF |
| Whitestone Fly Traveler 3006 | 11927444 | AMF |
| S A F Fame                   | 11935889 | AMF |
| S A F Easy Fortune           | 11935897 | AMF |
| Leachman Explorer            | 11947213 | AMF |
| Basin Max 602C               | 11951654 | AMF |
| Rito 3M2 of 5H11 GT Maximum  | 11967378 | AMC |
| V F Venture Forward          | 11973186 | AMF |
| Woodhill Supreme             | 11973368 | AMF |
| Brooks Premium 302           | 11983278 | AMF |
| TC Bonus                     | 11994557 | AMF |
| Gardens Prime Time           | 12007667 | AMF |

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| G T S V F Treasury           | 12019395 | AMF |
| B C C Bushwacker 41-93       | 12048084 | AMF |
| Leachman Saugahatchee 3000C  | 12075716 | AMF |
| G A R Evas Prescription 4553 | 12079809 | AMC |
| G A R Evas Consistence 3803  | 12079812 | AMF |
| B F Raindancer 012 306       | 12096699 | AMF |
| Leachman Booster             | 12108074 | AMF |
| One Way E308                 | 12127839 | AMF |
| Thomas Latigo                | 12139259 | AMF |
| S A F Choice Plus            | 12155777 | AMF |
| BT Direction 65D             | 12162865 | AMF |
| Gardens EXT 4137 S2          | 12166857 | AMF |
| Woodhill Crossfire           | 12170322 | AMF |
| Mill Coulee 6807-423         | 12174018 | AMF |
| Mr Wix of Mc Cumber 204      | 12177814 | AMF |
| G T Sentry                   | 12189371 | AMF |
| Plowman 1627 of Millbrae SAR | 12194989 | AMF |
| Homestead Blockbuster 409    | 12222286 | AMF |
| J L B Exacto 416             | 12223258 | AMF |
| L F New Trend 4100           | 12223857 | AMF |
| Butchs Maximum 3130          | 12241684 | AMF |
| R R Ferdinand 758D           | 12257225 | AMF |
| G T Triple Band              | 12270349 | AMF |
| C S U Aggie Ambush 4109      | 12296482 | AMF |
| G A R 6807 Traveler 4144     | 12304120 | AMF |
| Rito 5TR8 of Rita 3X12 RRT   | 12306217 | AMF |
| GDAR SVF Traveler 234D       | 12309327 | AMF |
| S A F Banker                 | 12326204 | AMF |
| Boyd Mainstream 5006         | 12344131 | AMF |
| Twin Valley Precision E161   | 12346200 | AMF |
| VDAR KA Legacy               | 12392161 | AMF |
| B T Ultravox 297E            | 12396224 | AMF |
| Rockn D Ambush 1531          | 12396365 | AMF |
| Gibb Illini                  | 12422806 | AMF |
| Hoff Ultra S C 108           | 12430389 | AMF |
| B A R Ext Traveler 205       | 12452829 | AMF |
| K C Prime Time 6029 95       | 12455165 | AMF |
| C A Future Direction 5321    | 12493607 | AMC |
| Sitz Intensifier 8206        | 12528428 | AMF |
| Rito 6I6 of 4B20 6807        | 12530601 | AMF |
| G A R Expectation 4915       | 12548568 | AMF |
| N Bar Prime Time D806        | 12557724 | AMF |
| Bon View Spectrum 1176       | 12564177 | AMF |
| B/R New Design 036-631       | 12569815 | AMF |
| B C C Lariat 6Z1 of B749     | 12578945 | AMF |
| PLS Rawhide F405             | 12597077 | AMF |
| S A F Focus of E R           | 12618076 | AMF |

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| T C A Engineer               | 12619399 | AMF |
| Circle A 216 LTD 6517        | 12670840 | AMC |
| Dalebanks Extender 6012      | 12672258 | AMF |
| Woodhill Riptide 823-606     | 12677801 | AMF |
| Gardens Expedition           | 12689078 | AMF |
| Connealy Frontline           | 12693793 | AMF |
| G A R Explosive 6313         | 12698439 | AMF |
| G A R Precision 9296         | 12717041 | AMC |
| Millcreek Diversity          | 12740561 | AMF |
| Connealy Vision 63           | 12753461 | AMF |
| Sitz Value 7097              | 12755998 | AMF |
| C S U Optimum Traveler 7123  | 12781813 | AMF |
| TC Advantage                 | 12783078 | AMF |
| Bon View New Design 1407     | 12783540 | AMF |
| Champion Hill B52 Traveler   | 12799597 | AMF |
| Vermilion Dateline 7078      | 12810693 | AMF |
| N Bar Emulation Ext A1747    | 12811512 | AMF |
| N Bar Bando 598 X4127        | 12813090 | AMF |
| P A R B Design Plus 97       | 12835604 | AMF |
| Barretts Solution            | 12837915 | AMF |
| A&b Yukon 7150               | 12862009 | AMF |
| Boyd Bluegrass 7047          | 12874222 | AMF |
| Brooks Ext 792               | 12881292 | AMF |
| Connealy Leadtime            | 12893612 | AMF |
| Perry Power Design 715       | 12911472 | AMF |
| Summitcrest Prime Cut 1G42   | 12915498 | AMF |
| G A R Exacto 5687            | 12920200 | AMF |
| Equity of P A R              | 12955187 | AMF |
| Sitz Reliant 8898            | 12996570 | AMF |
| C R A Bextor 872 5205 608    | 13009379 | AMF |
| Connealy Bottomline          | 13026915 | AMF |
| J R Something Special        | 13039059 | AMF |
| Bon View New Design 208      | 13044574 | AMF |
| Gardens Highmark             | 13047487 | AMF |
| Boyd New Day 8005            | 13050780 | AMF |
| Northern Improvement 4480 GF | 13054003 | AMF |
| Hyline Right Time 338        | 13058662 | AMF |
| Bon View New Design 878      | 13062750 | AMF |
| Ideal 7451 of 8103 4465      | 13066872 | AMF |
| Three Trees Everready C55D   | 13080972 | AMF |
| O C C Great Plains 943G      | 13092912 | AMF |
| S S Decatur 55H              | 13103836 | AMF |
| Creekstone Austin LTD 812    | 13113153 | AMF |
| Summitcrest High Prime 0H29  | 13122485 | AMF |
| Connealy Forefront           | 13169229 | AMF |
| G A R Pinnacle               | 13200618 | AMF |
| Nichols Extra H6             | 13207590 | AMF |

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| S S Traveler T510 8T4        | 13213164 | AMF |
| Feltons Meat Packer 62       | 13221587 | AMF |
| Fountains Fortress 52        | 13246306 | AMF |
| G A R Grid Maker             | 13254554 | AMF |
| G A R Paramount              | 13254727 | AMC |
| E X A R Scotch Cap 816       | 13282661 | AMF |
| R P Bushwacker 3 944         | 13284421 | AMF |
| B/R New Design 323-9150      | 13286230 | AMF |
| B/R Destination 727-928      | 13286246 | AMF |
| Basin Max 104J               | 13288602 | AMF |
| EXAR Anchorage 9479          | 13296807 | AMF |
| S A F Choice Plus 8275       | 13308692 | AMF |
| Ironwood New Level           | 13320150 | AMF |
| G T Premium Design 919       | 13321276 | AMF |
| H A R B High Plains 975 JH   | 13324510 | AMF |
| S A V Limited Edition 9283   | 13331795 | AMF |
| S A F Focus 9095             | 13333906 | AMF |
| S A F Strategy 9015          | 13334022 | AMF |
| KMK Alliance 6595 I87        | 13346328 | AMF |
| Baldrige Julio 157J          | 13352944 | AMF |
| Ardrossan Jackson J6         | 13356290 | AMF |
| BT Right Time 24J            | 13360311 | AMF |
| Leachman Boom Time           | 13361440 | AMF |
| Summitcrest Outlook          | 13384754 | AMF |
| Summitcrest Pfred 3B18 0J98  | 13384794 | AMF |
| Woodhill Confidence          | 13392170 | AMF |
| G A R Retail Product         | 13395329 | AMF |
| G A R Predestined            | 13395344 | AMF |
| Brooks Premium 910           | 13404446 | AMF |
| Baldrige Nebraska 901        | 13412671 | AMF |
| WAR Alliance 9126 6006       | 13433023 | AMF |
| Tosu Mick 9301               | 13436290 | AMF |
| Lemmon Seven Plus            | 13438124 | AMF |
| Hinds Hills TLAR Long Cut 47 | 13441628 | AMF |
| Connealy Lead On             | 13447282 | AMF |
| L T 598 Bando 9074           | 13448453 | AMF |
| S A F Mogcks Security        | 13457421 | AMF |
| Shamrocks Advantage 4609     | 13458027 | AMF |
| Vermilion Payweight J847     | 13469989 | AMF |
| Plattemere Database          | 13481798 | AMF |
| F A R Krugerrand 410H        | 13498476 | AMF |
| S A F Focus J30              | 13504290 | AMF |
| S A V 8180 Traveler 004      | 13512009 | AMF |
| Oak Hollow 7709 of 1318 1118 | 13521189 | AMF |
| Sitz Greatplains 9520        | 13531361 | AMF |
| S A F Connection             | 13544928 | AMF |
| Leachman Diamondback         | 13567991 | AMF |

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| S A F Directive              | 13574137 | AMF |
| Byergo Full Cut              | 13582536 | AMF |
| B/R New Frontier 095         | 13588640 | AMF |
| S A V Final Answer 0035      | 13592905 | AMF |
| Kapp Corner Post             | 13599697 | AMF |
| RAB-GAR Load Up 4049J        | 13608406 | AMC |
| Pascalar Ayres New View P310 | 13608527 | AMF |
| ER Denton K240               | 13619920 | AMF |
| Mohnen Modern Design         | 13620649 | AMF |
| ER Falcon K177               | 13626625 | AMF |
| RCC Preference               | 13645514 | AMF |
| LCC Number Crunch 3050K      | 13654637 | AMF |
| LCC New Frontier 3215K       | 13654695 | AMF |
| S A F Millcreek Charisma     | 13659860 | AMF |
| Larkota 814Z 011             | 13664352 | AMF |
| D B New Horizon 020          | 13665765 | AMF |
| Summitcrest Diamond 0K24     | 13667844 | AMF |
| Millers Bullseye J373        | 13670548 | AMF |
| Connealy Forecast            | 13676338 | AMF |
| Double G Marksman            | 13676998 | AMF |
| K C F Bennett Total          | 13687063 | AMF |
| Bushs Grand Design           | 13697595 | AMF |
| G T Echo                     | 13708459 | AMF |
| Woodhill Admiral 77K         | 13712447 | AMF |
| S A F Factor                 | 13718618 | AMF |
| SydGen Sterling 0298         | 13718631 | AMF |
| G A R Yield Grade            | 13724351 | AMF |
| G A R New Design 5050        | 13728513 | AMF |
| Fintry of Graham 52170       | 13739339 | AMF |
| H A Image Maker 0415         | 13739532 | AMF |
| Stukels Bandwidth            | 13742799 | AMF |
| Nichols Extra K205           | 13752642 | AMF |
| Three Trees Prime Cut 0145   | 13761928 | AMF |
| S S Objective T510 0T26      | 13776378 | AMF |
| FHCC Classic Rock            | 13778330 | AMF |
| Genetics by Design 049       | 13791489 | AMF |
| Rito 1I1 of 2536 Rito 6I6    | 13793825 | AMF |
| Rito 1I2 of 2536 Rito 6I6    | 13793826 | AMF |
| Rito 1I96 of 3015 Rito 6I6   | 13796655 | AMF |
| RES Volunteer 051            | 13798592 | AMF |
| Exar Sudden Impact 1537      | 13806056 | AMF |
| W C C Precision E161 J239    | 13806971 | AMF |
| Exar Expand 1241             | 13808820 | AMF |
| ACF New Design 0321          | 13814652 | AMC |
| Connealy Mayor 898           | 13815252 | AMF |
| Gardens Wave                 | 13818764 | AMF |
| R&R Architect 0223           | 13822057 | AMF |

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| Thomas Precision 1594       | 13824224 | AMC |
| SydGen Original 1013        | 13824342 | AMF |
| Boyd On Target 1083         | 13828202 | AMF |
| Basin Rainmaker 747L        | 13830028 | AMF |
| Connealy Viewpoint 901      | 13831100 | AMF |
| SydGen 1531 Ambush 1149     | 13834593 | AMF |
| N A Powerline of 206T       | 13838168 | AMF |
| Circle A Accurate 1038      | 13839683 | AMC |
| W C C Special Design L309   | 13846942 | AMF |
| SydGen Refocus              | 13850227 | AMF |
| 4 Point 8 of Ironwood       | 13850307 | AMF |
| Leachman Fundamental        | 13874784 | AMF |
| S A V Front Runner 0713     | 13875837 | AMF |
| S A V 5175 Bando 0699       | 13875838 | AMF |
| YON Southern Rock L26       | 13878619 | AMF |
| Baldrige Lightning L72      | 13880447 | AMF |
| Mytty In Focus              | 13880818 | AMF |
| King Kahn B100              | 13895274 | AMF |
| H S A F Bando 1961          | 13896250 | AMF |
| BR Midland                  | 13898124 | AMF |
| Gibb Iroquois 9111          | 13907951 | AMF |
| E&B 1680 Precision 1023     | 13913492 | AMF |
| Summitcrest Commando        | 13913514 | AMF |
| L C R Precision 112         | 13930599 | AMF |
| LCC Dillon G689L            | 13934918 | AMF |
| Woodhill Foresight          | 13936986 | AMF |
| LD Exactly 1912             | 13959251 | AMF |
| Exar Foundation 1806        | 13961547 | AMF |
| Holiday Express 1852        | 13961577 | AMF |
| Connealy Danny Boy          | 13966936 | AMF |
| H A Power Alliance 1025     | 13992383 | AMF |
| Summitcrest Roseda Designed | 13998476 | AMF |
| RAB-GAR Satisfaction 4191L  | 14009358 | AMF |
| RAB-GAR Leverage 4222L      | 14009384 | AMF |
| G A R Precision 5771        | 14011376 | AMF |
| G A R Precision 6041        | 14011400 | AMC |
| G A R Prime Design          | 14011547 | AMF |
| G A R Encore                | 14011611 | AMF |
| Morgans Direction 111 9901  | 14021056 | AMF |
| Exar Lutton 1831            | 14035047 | AMF |
| Krone Royal 1140            | 14037690 | AMF |
| Hyline Right Way 781        | 14037894 | AMF |
| R3 Scanner L527 SCC         | 14048508 | AMF |
| Rito 2X15 of Rita 8Z22 EXP  | 14056739 | AMF |
| Rito 2A63 of 2536 205       | 14084300 | AMC |
| Rito 2B94 of Rita 6K20 BW   | 14084352 | AMF |
| Rito 2V1 of 2536 1407       | 14088249 | AMC |

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| SydGen Contact              | 14088423 | AMF |
| Tehama Gridmaker L234       | 14091783 | AMF |
| Sitz New Design 349M        | 14094252 | AMF |
| Circle A Endeavor 2058      | 14098261 | AMF |
| SydGen Focus 2088           | 14099897 | AMF |
| EXAR Make the Grade 234     | 14100695 | AMC |
| VDAR Predicta Bull          | 14101541 | AMC |
| SydGen Ally                 | 14104725 | AMF |
| SydGen Prestige 1316        | 14106302 | AMF |
| SydGen 1407 Corona 2016     | 14106303 | AMC |
| C F Right Design 1802       | 14116881 | AMF |
| LD Redirect 11              | 14121653 | AMF |
| Vermilion Nebraska M404     | 14128747 | AMF |
| EXG Prime Plus M737 R3      | 14139259 | AMF |
| Three Trees Exacto 1517     | 14139514 | AMF |
| Boyd Captain 2067           | 14144643 | AMF |
| B C Matrix 4132             | 14159119 | AMF |
| RES Exceed 114              | 14167786 | AMF |
| D C C Rito Prime 1I5        | 14171230 | AMF |
| Twin Eagles No Fault M904   | 14173159 | AMF |
| Riverbend Blueprint L24     | 14181726 | AMF |
| B C Marathon 7022           | 14187839 | AMF |
| B/R Ambush 28               | 14188956 | AMF |
| Rito 2 878 of 2536 BVND 878 | 14200755 | AMF |
| Mill Brae Freightliner 2096 | 14201376 | AMF |
| Champion Hill Edition 2029  | 14202761 | AMF |
| Triple J Design of Foxcross | 14204395 | AMF |
| Bluegrass Major Design 202  | 14209689 | AMF |
| S A V Last Call 2063        | 14215210 | AMF |
| Connealy Alliance 995       | 14216456 | AMF |
| Connealy Onward             | 14216491 | AMF |
| Connealy Safe Lead          | 14216571 | AMF |
| LCC Sultan G041             | 14218202 | AMF |
| LCC New Standard            | 14218253 | AMF |
| G A R 65R Authority         | 14222526 | AMC |
| G A R Cimarron              | 14222595 | AMF |
| G A R Integrity             | 14222612 | AMF |
| G A R Solution              | 14222615 | AMC |
| EXAR New Look 2971          | 14230122 | AMF |
| KG Dakota                   | 14230973 | AMF |
| TC Gridiron 258             | 14237017 | AMF |
| BT Equator 395M             | 14237157 | AMF |
| K A R Alliance 258          | 14245842 | AMF |
| Tehama Total M811           | 14251765 | AMF |
| DDA Emblazon 27C            | 14257843 | AMF |
| 21AR Coal Bank C014         | 14267926 | AMF |
| Blevins Raindance 2503      | 14270028 | AMF |

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| SydGen Eclipse 2478          | 14291315 | AMF |
| Dr J Analyst M250            | 14292649 | AMF |
| SydGen Bouncer 2458          | 14298428 | AMF |
| S S Rito Rito R011 2R12      | 14299352 | AMF |
| G A R Premium Product        | 14300920 | AMC |
| G A R US Premium Beef        | 14301014 | AMF |
| Sinclair Net Present Value   | 14311951 | AMF |
| H A R B Windy 702 JH         | 14321158 | AMF |
| Spur Success 2801            | 14327307 | AMF |
| EXAR Nominal 3550            | 14343264 | AMF |
| Lafllins Cutting Edge 2075   | 14355577 | AMF |
| Sinclair Open Range 2Q23     | 14357467 | AMF |
| G G Chisholm                 | 14361794 | AMF |
| Boyd Poundmaker 21           | 14367367 | AMF |
| Stevenson American Idol 9273 | 14368395 | AMC |
| Stevenson Benchmark N190     | 14368434 | AMF |
| Sitz Rainmaker 9723          | 14368850 | AMF |
| Big Elban of Sydgen 3023     | 14377095 | AMF |
| Sinclair Rito Legacy 3R9     | 14378386 | AMF |
| EXG Osage N112 R3            | 14381890 | AMF |
| EXG Midnight N657 R3         | 14382607 | AMF |
| EXG Outcross N655 R3         | 14384566 | AMF |
| B/R Future Direction 3100    | 14385286 | AMF |
| B/R 65R Genesis              | 14385395 | AMF |
| S A R New Frontier 095 1156  | 14386761 | AMF |
| EXAR Numerical 3919          | 14390643 | AMF |
| B C Maverick 2702 ET         | 14391235 | AMF |
| B C Mid Emblazon 854E 702    | 14394786 | AMF |
| SydGen OnStar 3217           | 14395270 | AMC |
| B C Emblazon 854E 8023       | 14397563 | AMF |
| Basin Future Direction 8833  | 14400977 | AMC |
| Basin Future Direction N905  | 14401002 | AMF |
| EXG Rangeland 3946           | 14404295 | AMF |
| EXG Heartland 3947           | 14404296 | AMF |
| Circle G Kash 2189           | 14412753 | AMF |
| K C F Bennett Architect M299 | 14416680 | AMF |
| K C F Bennett Coalition SCC  | 14417348 | AMF |
| Kenny's Creek Sandy S15      | 14418962 | AMF |
| G T Shear Force              | 14419184 | AMF |
| Basin Payweight 9333         | 14419602 | AMF |
| RAB-EGL Blue Moon 4407M      | 14422326 | AMF |
| K M Future Direction 3902    | 14424083 | AMF |
| Ironwood Innovator           | 14429978 | AMF |
| Ayres Sudden Revival of OCC  | 14434266 | AMF |
| ALC Nobleman N01N            | 14448891 | AMF |
| M A R Midland Empire 3092    | 14454058 | AMF |
| S A V Peacemaker 3179        | 14455342 | AMF |

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| O C C Magnitude 805M         | 14456390 | AMF |
| S A V Hemi 3133              | 14458258 | AMF |
| Sitz New Design 458N         | 14474596 | AMF |
| ER Justice N013              | 14492305 | AMF |
| S A V Trailblazer 3015       | 14495534 | AMF |
| L T Bandwagon 3105           | 14502851 | AMF |
| G A R User Friendly          | 14504755 | AMF |
| K M Keystone 1913            | 14505152 | AMC |
| G A R Preeminent             | 14506274 | AMC |
| Bushs Strut 756              | 14508531 | AMF |
| BT Crossover 758N            | 14509685 | AMC |
| Riverbend Mile High 3718     | 14512407 | AMC |
| Three Trees Next Step        | 14513180 | AMF |
| Mohnen Brushpopper 353       | 14514372 | AMF |
| LRA Foresight 26C            | 14515789 | AMF |
| K C F Bennett Index          | 14521474 | AMF |
| Ideal 3542 of 7451 7417      | 14523007 | AMF |
| Connealy Overtime            | 14528172 | AMF |
| Connealy Leader              | 14528246 | AMF |
| Connealy Reflection          | 14528330 | AMF |
| EXAR Non-Stop 3967           | 14529106 | AMF |
| Summitcrest Sears Star Power | 14542822 | AMF |
| Summitcrest High Prime 0N15  | 14542824 | AMF |
| Brooks Night Off 309         | 14551206 | AMF |
| Baldrige Navigator N5        | 14552847 | AMF |
| ALC Big Eye D09N             | 14560689 | AMF |
| D C C Rito Direct 3C3        | 14570071 | AMF |
| LCC New Chapter G831N        | 14570934 | AMF |
| SydGen Substance 3450        | 14573335 | AMF |
| SydGen Boom Time 3483        | 14573363 | AMF |
| D C C Rito Platinum 3J4      | 14575900 | AMF |
| Woodhill Commander 143L-132N | 14576247 | AMF |
| Sinclair Telecast 01S3       | 14587431 | AMF |
| Lemmon Newsmaker N156        | 14591941 | AMF |
| Sugar Loaf Direct Hit N021   | 14595121 | AMF |
| LCC Outlook G800N            | 14599782 | AMC |
| LCC Arrival G847N            | 14599797 | AMC |
| LCC Innovation H009N         | 14599814 | AMF |
| LCC Few Dollars More H013N   | 14599815 | AMF |
| 4G Regulator                 | 14608561 | AMF |
| Whitestone Tiger T159        | 14630766 | AMF |
| Rito 4612 of Rita 8G23 1I2   | 14631681 | AMF |
| Rito 4D7 of 2536 338         | 14631852 | AMF |
| Rito 4L41 of Rita 2B41 208   | 14631908 | AMF |
| Rito 4L6 of 2536 208         | 14641538 | AMF |
| F R F Midland 4026           | 14657131 | AMF |
| Stevenson CE Deluxe 1914     | 14659834 | AMF |

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| Quaker Hill Objective 3J15 | 14660859 | AMF |
| SydGen Platinum 4027       | 14663248 | AMF |
| SydGen Itasca 4083         | 14663267 | AMF |
| SydGen Kahlua 4204         | 14664625 | AMF |
| EXAR Predictable 4158      | 14667449 | AMF |
| EXAR Problem Solver 4181   | 14667450 | AMF |
| B/R New Day 454            | 14675445 | AMF |
| B/R Future Direction 4268  | 14675477 | AMF |
| Monarch Pahokee 3016       | 14676756 | AMF |
| 3F Emblazon 3652           | 14679694 | AMF |
| EXAR Pit Boss 409          | 14682821 | AMF |
| Basin Yellowstone 116P     | 14686102 | AMF |
| Basin Franchise P142       | 14686137 | AMF |
| Basin Up The Limit         | 14686155 | AMF |
| SydGen Rito Plus 4051      | 14686985 | AMF |
| EXAR Phenomena 4037        | 14687512 | AMF |
| GDAR Game Day 449          | 14691231 | AMF |
| DAJS The Matrix 008        | 14693095 | AMF |
| SydGen Journey 4355        | 14712641 | AMF |
| Basin Rainmaker P175       | 14724271 | AMF |
| S A V 004 Density 4336     | 14725035 | AMF |
| EXG New Design P620 R3     | 14728662 | AMF |
| Genex Replica 1081         | 14737017 | AMC |
| S A V Net Worth 4200       | 14739204 | AMF |
| Gardens Prime Star         | 14740749 | AMF |
| LT Curve Bender 4810 of EA | 14742267 | AMF |
| G A R Prominent            | 14743506 | AMC |
| Bonnors Up The Limit 7P    | 14745477 | AMF |
| Woodlawn Charge On 14      | 14754153 | AMF |
| Rito 4I6 of 2536 6807      | 14768724 | AMC |
| Rito 4I9 of 2536 6807      | 14768727 | AMF |
| Rito 4L60 of 2536 BVND 208 | 14768728 | AMC |
| Rito 4S5 of 2536 SA        | 14768733 | AMF |
| Boyd Landmark 405          | 14769662 | AMF |
| Sinclair Extra 4X13        | 14774030 | AMF |
| MCC Daybreak               | 14777016 | AMF |
| Ideal 4355 of OT26 2440    | 14779044 | AMF |
| G A R High Mesa            | 14790816 | AMF |
| Summitcrest Designer 177P  | 14790998 | AMF |
| B C Lookout 7024           | 14791623 | AMF |
| Woodhill Mainline          | 14793708 | AMF |
| Brooks Easy Way Out 4260   | 14796227 | AMF |
| S A V 5175 Bando 4597      | 14798552 | AMF |
| S A V 004 Traveler 4836    | 14798616 | AMF |
| G A R Simplicity           | 14800786 | AMC |
| Doerr Defiance             | 14802410 | AMF |
| TC Boom Time 434           | 14814936 | AMF |

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| Sitz Hindsight 973P          | 14817265 | AMF |
| S A V 004 Predominant 4438   | 14823655 | AMF |
| S A V 004 Hold'em 4452       | 14823656 | AMF |
| S A V Bachelor 4404          | 14823774 | AMF |
| TC Power Stroke 4118         | 14840492 | AMF |
| S A V Initiative 4406        | 14842384 | AMF |
| Connealy Foundation 426      | 14843192 | AMC |
| Connealy Freight Train       | 14843254 | AMF |
| Connealy Resource FD 464     | 14843300 | AMC |
| TC Total 410                 | 14844711 | AMF |
| TC Rito 416                  | 14844714 | AMF |
| TC Beef Maker 480            | 14844728 | AMF |
| Connealy Whitman             | 14845068 | AMF |
| Connealy Grant 208 4246      | 14845081 | AMF |
| Mohnen Day Ahead 144         | 14848339 | AMF |
| Summitcrest Complete 1P55    | 14850409 | AMF |
| SCR Promise 4042             | 14851313 | AMF |
| Tehama Vigilance P139        | 14852720 | AMF |
| MOGCK Whispering Wind 584    | 14874385 | AMF |
| Mytty ForeFront 77P          | 14874578 | AMF |
| SydGen Triumph               | 14880311 | AMC |
| K C F Bennett Performer      | 14885809 | AMF |
| Dunlouise Cortachy Boy D137  | 14898814 | AMF |
| Blevins Retail Design 4812   | 14899284 | AMF |
| Rockin Horse Tailor Made 456 | 14899673 | AMF |
| Basin Center Cut             | 14931356 | AMF |
| Ardrossan Connection X15     | 14933037 | AMC |
| Rito 593 of 2821 RP          | 14934706 | AMF |
| EXAR Rejuvenator 5401        | 14961745 | AMF |
| Sitz Upward 307R             | 14963730 | AMF |
| Sinclair Excellency 5X25     | 14969822 | AMF |
| Basin Future Direction 3R01  | 14973975 | AMF |
| SydGen Bullet                | 14977480 | AMF |
| EXAR Rito 5118 of Rito 112   | 14984112 | AMF |
| Diamond On Track 748R        | 14993300 | AMF |
| Stevenson Cattleman R142     | 15003218 | AMF |
| Stevenson Moneymaker R185    | 15003238 | AMF |
| EXAR 263C                    | 15012747 | AMF |
| Stevenson Paycheck 9415      | 15015207 | AMF |
| Quaker Hill Rito 2V1 4V1     | 15016931 | AMC |
| Three Trees Crossroads R0638 | 15022955 | AMF |
| D R Retail Product 4637      | 15026357 | AMF |
| Diamond Direct Deposit 3R57  | 15030668 | AMC |
| Basin Expedition R850        | 15031034 | AMF |
| G A R Right Direction        | 15033947 | AMF |
| BC 7022 Raven 7965           | 15034593 | AMF |
| Diamond Benchmark 3R65       | 15041285 | AMF |

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| Autumn Oaks Super Star 302   | 15076709 | AMF |
| GAR-EGL Protege              | 15098880 | AMF |
| Circle S At Ease 4221        | 15098911 | AMC |
| S A V Future Investment 5662 | 15107823 | AMC |
| S A V Mandan 5664            | 15107825 | AMF |
| S A V New Year 5320          | 15108200 | AMF |
| S A V Bismarck 5682          | 15109865 | AMF |
| N U Option 5012              | 15118068 | AMF |
| Brooks Premium Product 547   | 15124610 | AMF |
| Summitcrest Direction 2R71   | 15125595 | AMC |
| Bluegrass Right Time 500     | 15127569 | AMF |
| G A R Selective              | 15129617 | AMF |
| G A R Objective 7125         | 15129674 | AMF |
| G A R Cloudburst             | 15134123 | AMF |
| B P F Special Focus 504      | 15140670 | AMF |
| Rito Revenue 5M2 of 2536 Pre | 15142281 | AMF |
| Rito 5M43 of 2536 PRED       | 15142305 | AMF |
| LT Timberwolf 5014           | 15147477 | AMF |
| Connealy Power One           | 15148585 | AMF |
| Connealy Thunder             | 15148659 | AMF |
| Connealy Compass 510E        | 15148739 | AMF |
| Mytty In Line                | 15148954 | AMC |
| Connealy Contrast            | 15150605 | AMF |
| Connealy Danny 5398          | 15150630 | AMF |
| Connealy Black Baron of SCAR | 15150757 | AMC |
| HA Program 5652              | 15161251 | AMF |
| SCR Superior 210M-50203      | 15163839 | AMF |
| CAR Efficient 534            | 15170660 | AMF |
| HD Dunn Altitude 5011        | 15183035 | AMF |
| Tehama Band XL R739          | 15183732 | AMF |
| Tehama Reputation            | 15186606 | AMC |
| V A R Midland 5271           | 15191744 | AMF |
| LCOC Repairman G430R         | 15213792 | AMC |
| Blevins Mission 5709         | 15231166 | AMF |
| Stevenson Bullseye 3R11      | 15247770 | AMF |
| T K Big Bend R35             | 15249612 | AMF |
| RDDA Overload 2437R          | 15260057 | AMF |
| EXAR Spartan 6225            | 15262910 | AMF |
| EXAR Showton 6230            | 15262914 | AMF |
| Rito 6EM3 of 4L1 Emblazon    | 15266350 | AMF |
| Rito 6EM6 of 4L3 Emblazon    | 15266353 | AMF |
| EXAR Prime Premium 6444      | 15276737 | AMF |
| G A R Prediction             | 15283265 | AMF |
| G A R Predestined N5905      | 15283299 | AMF |
| Rito 6656 of 021 Rito 112    | 15310366 | AMF |
| HARB Pendleton 765 J H       | 15313140 | AMF |
| Sitz JLS Forward 568S        | 15327227 | AMF |

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| T O S U Hawk 5306            | 15330093 | AMF |
| SydGen C C & 7               | 15330743 | AMF |
| Three Trees Rocky Top        | 15331756 | AMC |
| Three Trees Big Top S1116    | 15331769 | AMF |
| ThreeTrees Blackfoot Mile Hi | 15331771 | AMC |
| Basin Bellagio 410S          | 15331879 | AMF |
| Basin Payweight 025S         | 15332038 | AMF |
| Basin Payweight 006S         | 15332050 | AMF |
| SydGen Mandate 6079          | 15337433 | AMF |
| Boyd Next Day 6010           | 15347911 | AMF |
| Casino Objective B135        | 15349689 | AMF |
| SydGen Trust 6228            | 15354674 | AMF |
| Trowbridge Crusader 614      | 15355003 | AMF |
| Thomas Grade Up 6849         | 15356040 | AMF |
| K C F Bennett Outlook R448   | 15365425 | AMF |
| S A V John Wayne 6220        | 15369092 | AMF |
| S A V Heritage 6295          | 15369205 | AMF |
| Basin Dollar B 9916          | 15371285 | AMF |
| Sinclair Extravagant 6X7     | 15380785 | AMF |
| Stevenson Online 11S0        | 15384833 | AMC |
| Whitestone Satisfaction      | 15393885 | AMF |
| M A R Jefferson 6009         | 15396062 | AMF |
| Lafllins South Wind 5258     | 15418431 | AMF |
| BC Rocket 44                 | 15430961 | AMF |
| E&B Blueprint 691            | 15434180 | AMF |
| Three Trees Ante Up T0170    | 15443045 | AMF |
| M A 1961 Bando 346-90        | 15446550 | AMF |
| Exar PAF Sizzle 620          | 15456246 | AMF |
| Summitcrest Rush Hour 0S23   | 15456344 | AMF |
| Summitcrest Darth 1S37       | 15458959 | AMF |
| Summitcrest Stardom 1S54     | 15458960 | AMF |
| TC Advantage Plus 680        | 15462668 | AMF |
| G A R Symmetry               | 15463997 | AMF |
| G A R Remedy                 | 15464017 | AMC |
| G A R Ultimate               | 15464043 | AMF |
| EXG Masterson 6011 PPC       | 15470489 | AMC |
| G A R Game On                | 15482196 | AMF |
| Limestone Converter S239     | 15487342 | AMF |
| Tehama Silverado S105        | 15488048 | AMF |
| Mill Brae Bluestem 6081      | 15488089 | AMF |
| Connealy Full Freight        | 15490794 | AMF |
| Connealy All Around          | 15490811 | AMF |
| Connealy Forward             | 15491633 | AMF |
| Connealy Formation 60C       | 15493207 | AMF |
| Rito 6EMA of 4L3 Emblazon    | 15498429 | AMF |
| Rito 6M51 of Rita 2V5 Pred   | 15498627 | AMF |
| Spur Reward 6005             | 15507991 | AMF |

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| MRCC New Idea 629           | 15509162 | AMF |
| Mr JT High Light 638        | 15513053 | AMF |
| T D L Nine Irons Preemptor  | 15515066 | AMF |
| T D L Nine Irons 3335S      | 15515072 | AMF |
| S D R Chief Justice 662     | 15518651 | AMF |
| V A R Prime Rate 6254       | 15521467 | AMF |
| Tehama Online S472          | 15522896 | AMF |
| F V 20K King 308M           | 15539210 | AMF |
| Connealy Impression         | 15543702 | AMF |
| SydGen Turbo 6684           | 15553710 | AMF |
| Mohnen Dynamite 1356        | 15585939 | AMF |
| B C C Emblazon 6062-6022    | 15599345 | AMF |
| Sinclair Eclipse            | 15601553 | AMF |
| Quaker Hill On Board 6BT2   | 15601884 | AMF |
| Five Star Sum Total 6010    | 15606026 | AMF |
| G T Global Image            | 15607046 | AMF |
| V A R Prospector 7093       | 15623928 | AMF |
| RM Ruger 6502               | 15626702 | AMF |
| ALC Shooter B01S            | 15630936 | AMF |
| Sitz Jackson 431T           | 15637146 | AMF |
| Sinclair Multi-X            | 15644157 | AMF |
| Exar 263C 7256              | 15661253 | AMF |
| Circle A Endurance 6679     | 15667302 | AMF |
| S A V Pioneer 7301          | 15688392 | AMF |
| Basin Expedition 3T90       | 15690301 | AMF |
| Basin Spread 304T           | 15690358 | AMF |
| Basin Future Direction 2T15 | 15694062 | AMF |
| Basin High Definition 3T84  | 15696204 | AMC |
| Stevenson Moneymaker 576T   | 15696472 | AMF |
| Thomas Synergy 7261         | 15700047 | AMF |
| SQ Credence 67S             | 15705880 | AMF |
| EXAR Titlelist T011         | 15714917 | AMF |
| G T Tender Force            | 15723180 | AMF |
| Prime Maker Plus            | 15729763 | AMF |
| Baldrige Progressive S834   | 15730796 | AMF |
| Werner Westward 357         | 15738589 | AMF |
| Three Trees Lexington T0678 | 15743897 | AMC |
| Yon Future Focus T219       | 15748572 | AMF |
| ONeills Encore              | 15753349 | AMF |
| CSU Ram Nation 710S         | 15774209 | AMF |
| PVF ALL PAYDAY 729          | 15779234 | AMF |
| S S Insight T20             | 15790033 | AMF |
| Efficiency NFI              | 15793806 | AMC |
| Basin Mile High 60T4        | 15799258 | AMC |
| Ardrossan Admiral A2        | 15807819 | AMF |
| Garret's On Target 323C     | 15816127 | AMF |
| WAR Architect T040          | 15817542 | AMF |

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| MCATL Triple Stack           | 15818622 | AMF |
| UI Peer Reviewed T083        | 15823918 | AMF |
| Mill Brae Shawnee 7156       | 15827916 | AMF |
| Lemar Dakota Gold 18T        | 15828386 | AMF |
| Leachman Prowess G136T       | 15829455 | AMF |
| Lyons Santa Fe 6119          | 15832299 | AMF |
| Lyons Prairie Fire           | 15832303 | AMC |
| Connealy Answer 71           | 15832579 | AMF |
| Connealy Wrangler            | 15832596 | AMF |
| Connealy Right Answer 746    | 15832750 | AMF |
| SCR Right Cross 70024        | 15836708 | AMF |
| TC Aberdeen 759              | 15840414 | AMF |
| Leachman GB Meteor G677T     | 15862795 | AMF |
| Koupals B&B Balance 7022     | 15866553 | AMC |
| 21AR Roundup 7005            | 15883460 | AMF |
| Poss Total Impact 745        | 15885405 | AMF |
| MOGCK Sure Shot              | 15899735 | AMF |
| Leachman Ramses G054T        | 15907167 | AMF |
| Leachman Scotsman G023T      | 15909868 | AMF |
| Leachman Disciple G046T      | 15911861 | AMF |
| Sinclair 20/20               | 15913232 | AMF |
| Leachman Meat Case G049T     | 15914175 | AMF |
| Leachman Authentic G067T     | 15914177 | AMF |
| Nichols Quiet Lad T9         | 15922661 | AMF |
| Duff Standout 785            | 15934618 | AMF |
| Basin ON Target 7T16         | 15940911 | AMF |
| Summitcrest Grid Buster T096 | 15957231 | AMF |
| Blue and Gray Lee V04        | 15973416 | AMF |
| Blue & Gray Jackson 90V      | 15974345 | AMF |
| RM I Trend 7528              | 15989605 | AMF |